This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1. (Previously amended) In a system for manufacturing a three-dimensional object by deposition of molten material drops on a substrate, an apparatus for producing said molten material drops comprising:

a crucible for holding a reservoir of molten material;

a conically-shaped orifice having a fixed outlet diameter disposed in the bottom of said crucible through which a jet of said molten material flows towards said substrate; and

an oscillating mechanical member for breaking said flow of molten material into said molten material drops, said member having a conically-shaped head for cooperating with said orifice and for continuously varying the effective size of said orifice, said conically-shaped head comprising a slanted radial portion and a tip portion extending through the orifice, the effective diameter d_{eff} of said orifice and said jet being defined by the equation $d_{eff} = [d_0^2 - (d_0 - \delta \tan \theta)^2]^{1/2}$, wherein d_0 is a variable representing said outlet diameter, δ represents the amount of said tip portion extending through the orifice, and θ represents a variable slant angle corresponding to said slanted radial portion.

Claim 2. (original) The apparatus according to claim 1, wherein said crucible comprises:

a first annular surface extending radially from the center of the crucible having an elevation h_0 above the lower surface of said crucible, and an outer contour defined by a first diameter d_1 greater than d_0;

a second annular surface extending radially from the center of the crucible having an elevation $h_1 + h_0$ above the lower surface of said crucible, an inner contour defined by the first diameter d_1, and an outer contour defined by a second diameter d_2 greater than d_1; and

an outer cyliindrical wall having an inner contour defined by the second diameter d_2.

Claim 3. (previously amended) The apparatus according to claim 1, wherein said oscillating mechanical member is coupled to a piezoelectric oscillator that oscillates at a frequency of f_{opt} defined by the equation $f_{opt} = 0.225U_j/d_{eff}$, wherein d_{eff} is the effective diameter of said jet and U_j is the velocity of said jet through said orifice.

Claim 4. (New) The apparatus according to claim 1, wherein θ ranges between 5 and 30 degrees.

Claim 5 (New) The apparatus according to claim 1, wherein θ ranges between 5 and 45 degrees.

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